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Mr. John J. Gerig
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Build Your Own TELEVISION RECEIVER*

Complete Construction Details for a TV Receiver That Covers all Channels From 44-88 mc.

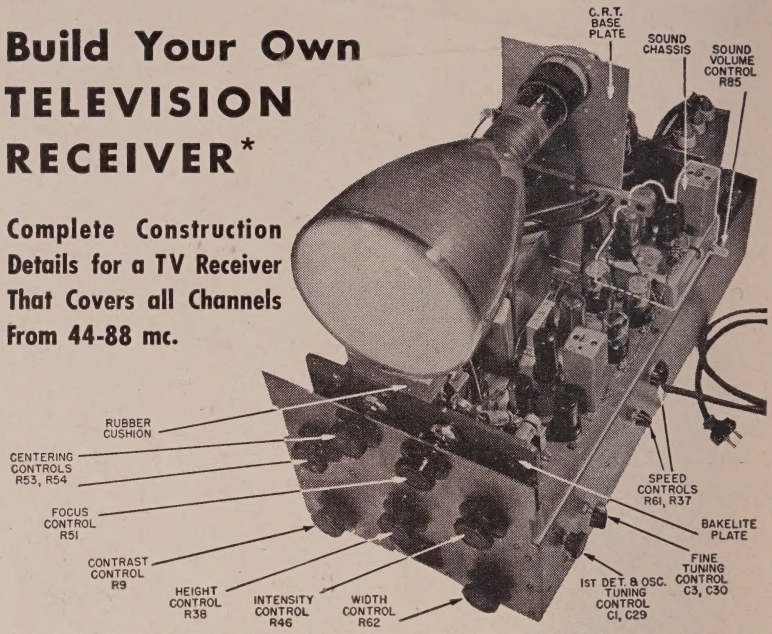


Fig. 1. Top-front view of completed television receiver with video tube shown in place. This unit has been converted from a war surplus type BC-412 oscilloscope. Many of the original components used in the oscilloscope are utlized in this set.

CONTINUED FROM OCTOBER ISSUE

The techniques used in constructing and servicing television receivers are far removed from those used for AM receivers. Because television receivers are comprised of various intricate circuits it should be borne in mind that in order to successfully construct the unit described in this article one should have had some previous practical experience in the construction of radio equipment.

The free-running frequency of either oscillator stage is controlled by varying the resistance in the grid circuit. The *horizontal oscillator* uses a 100,000 ohm variable resistor known as the *Horizontal Speed* control. And the *vertical oscillator* uses a 500,000 ohm variable resistor known as the *Vertical Speed* control. Mount both controls on the side of the chassis near their respective oscillator tubes so that the grid leads are as short as possible.

Amount of output voltage from the *horizontal oscillator* is controlled by means of a 500,000 ohm potentiometer known as the *Horizontal Size* control, or the *Width* control. Amount of output voltage from the *vertical oscillator* can be varied by means of a 2 megohm potentiometer known as the *Vertical Size* control, or the *Height* control. These two controls determine the width and height of the television image on the screen of the cathode-ray tube.

* *By Leon S. Wecker and Tom Gootee in "Radio News."*

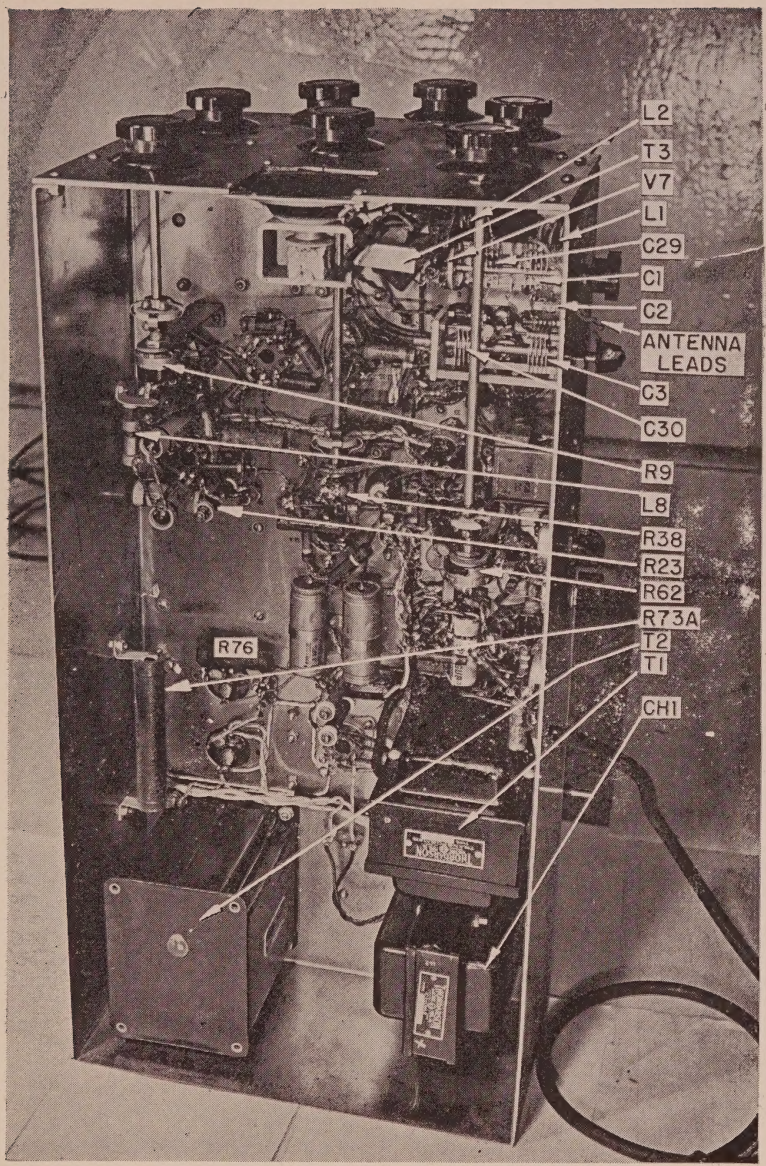


Fig. 3. Under-chassis view of completed receiver. Note that all components are grouped closely to form their respective stages. Sound trap, L_4 (not visible in the photo), is mounted directly under the tuning condensers, C_3, C_{30}.

The *Height* and *Width* controls are mounted underneath the chassis, each on a bracket that is part of the steel chassis. Extension shafts with *insulated couplings* protrude through openings in the lower part of the steel front panel (Fig. 3). Original knobs can be placed on the two protruding shafts, and their panel designations changed to *Height* and *Width* respectively.

Preliminary Test

At this point, a preliminary check of the assembled equipment can be made to test the operation of the scope control circuits.

First, turn *all* controls on the front panel to the "OFF" position (full counter-clockwise) and apply 110-120 volts a.c. to the power stages.

Turn up the *Intensity* control slowly —until a faint spot appears on the screen of the picture tube.

Then vary the position of the *Focus* control to obtain the smallest and sharpest pin-point of light. However, don't make the spot too bright, since this may seriously damage the screen of the tube.

Next, check the operation of the two centering controls. Any adjustment of the *Horizontal Centering* control should cause a horizontal movement of the spot on the screen. Adjustment of the *Vertical Centering* control should cause a vertical movement of the spot. Action of the two centering controls must be independent of each other.

If the spot fails to react to one or more of the four front panel controls, turn off the equipment and recheck all wiring relative to these circuits.

If the spot reacts favorably, advance the *Horizontal Size* or *Width* control until a thin horizontal line is visible on the screen. As this control is adjusted, the horizontal line should vary in width.

If a horizontal line fails to appear or if the sweep is erratic, turn off the equipment and recheck all wiring in the vicinity of the *horizontal oscillator* and *horizontal amplifier* stages.

Test the *Vertical Size* or *Height* control by first closing the *Width* control and then slowly opening the *Height* control. Result should be a thin vertical line, varying in height as the *Height* control is adjusted.

If a vertical line fails to appear or if the sweep is erratic, turn off the equipment and recheck all wiring in the vicinity of the *vertical oscillator* and *vertical amplifier* stages.

Finally Open the *Width* control to a point where the horizontal line on the screen is of optimum width (just within the confines of the edge of the picture tube), and open the *Height* control so that the image on the screen is of approximately correct height. Then, if the control circuits have been wired properly, the result on the screen of the picture tube should be an almost-square *raster.*

Next stage to be wired is the *synchronizing amplifier,* using a type 6N7 tube. Function of this stage is the amplification of sync pulses received from the *second detector* stage of the video circuit.

Mount the *sync amplifier* tube in front of the *vertical oscillator* tube (Fig. 4) so that the output of the *sync amplifier* can be coupled conveniently to both oscillator stages.

Two kinds of pulses are required, horizontal sync pulses at a high frequency and vertical sync pulses at a lower rate of repetition. Both kinds are obtained from the single output of the *sync amplifier* by use of suitable *R-C* network filters to provide separation. Method of separation is evident by referring to the circuit diagram.

Horizontal sync pulses must be of higher frequency than the vertical sync pulses. Thus, an *R-C* network (high-pass filter) is used between the *sync amplifier* and the input to the *horizontal oscillator* stage, and another *R-C* network (low-pass filter) is used between the *sync amplifier* and the input of the *vertical oscillator* stage.

In this way the two oscillator stages are synchronized with their respective high- and low-frequencies pulses, and the resultant beam sweep within the picture tube is synchronized with the sync transmissions of any television station to which the *first detector* of the receiver is tuned.

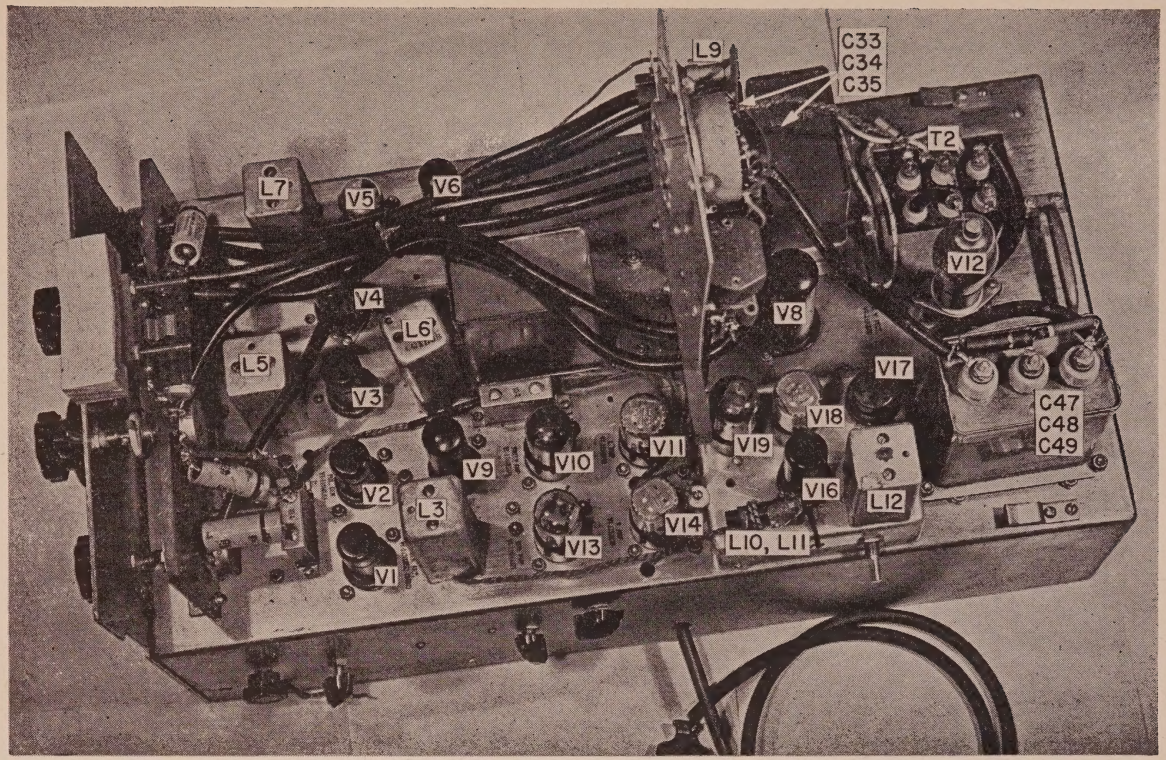


Fig. 4. Top view of completed television receiver, with cathode-ray tube removed. Note cushioned bracket for picture tube. High voltage units are toward rear of the chassis near the actual tube connections. The large, unidentified can, mounted in the center of the chassis, contains a bank of .1 μfd., 600 v. condensers.

First Detector

The input of the receiver consists of a *first detector* stage using a type 1852 tube, with a *local oscillator* using a type 955 acorn tube. The r.f. oscillator is tuned *above* the frequency of the incoming television signal, and mixing of the two signals produces a strong intermediate beat frequency.

Particularly critical of construction and adjustment is the *first detector* stage and its associated *local oscillator.*

Each of these stages is tuned by a variable 50 $\mu\mu$fd. condenser. They may be turned individually, or the two condensers may be ganged together.

To accommodate two *separate* tuning condensers, drill two holes in the side of the chassis so that the condensers can be mounted close to each other *and* as close as possible to their respective *grids.* If a two-gang condenser is used, drill only one hole in the side of the chassis so that the condensers can be mounted *close to their respective grids.*

The *first detector* tube is placed forward (Fig. 4) above the chassis, but the *local oscillator* tube is mounted underneath the chassis just behind the oscillator tuning condenser, so that all leads of the oscillator circuit are as short as possible.

Drill two holes in the chassis above and just behind the oscillator tuning condenser and mount the acorn socket on two 6/32 stand-off bolts. Height of the socket may be adjusted by running two nuts *under the socket* up to the desired position.

The 100 $\mu\mu$fd. condenser (C_3) used in the oscillator grid circuit should be temperature compensated to minimize any frequency shift due to changes in temperature.

The r.f. coils for the *first detector* and the *local oscillator* stages are made from No. 14 wire. They are air wound with a diameter of about ¾ inch. The exact number of turns cannot be given as the coils will vary in size for each individual case, due to differences in the placement of parts, types of sockets, length of circuit leads, and other common factors. However, *in most cases* between 3 and 4 turns of wire should be about right.

The cathode of the 955 tube is connected to a point on the oscillator coil L_2 about one turn in from the grounded side of the coil.

Solder the completed r.f. coils to their respective tuning condensers.

The *local oscillator* functions at a frequency higher than the television signal frequency by an amount that represents the desired intermediate frequency of the video signal; 12.75 megacycles.

Close proximity of the oscillator coil and the first detector coil is sufficient for adequate mixing, and additional coupling is not required to produce a strong beat frequency.

If desired, additional 10 $\mu\mu$fd. fine-tuning condensers (C_3, C_{30}) can be placed in parallel with the oscillator and first detector main tuning condensers as shown in the circuit diagram. The two fine-tuning condensers should be ganged.

Video Stages

Following the *first detector* stage of the receiver, the video signal is applied to three video i. f. *amplifiers,* each stage using a type 1852.

Since the video signal is composed of a very wide band of frequencies, all components of the *i.f. amplifier* stages must be capable of passing a wide band of frequencies or the definition of the final television picture will be considerably impaired. The chief difficulty in maintaining a broad-band frequency response lies in the construction and adjustment of the i.f. tuning coils.

It may be possible to purchase broad-band i.f. coils at 12.75 megacycles, which would be adequate for use in this receiver.

However, if such coils are not available, they may be constructed without too much trouble.

The best source of parts are old or defective 465 kc. i.f. transformers used in broadcast receivers. These units provide most of the essential units. Unwind the old coils, but keep the coil forms for the new video i.f. coils. Also retain the old assembly bracket, bolts, and shield can.

Intermediate frequency of the video signal is 12.75 mc. To construct a coil for this frequency, wind about 17 turns of No. 28 wire on a ¾ inch coil form.

The same trimmer condensers used on the old i.f. transformers can be used across the newly wound coil. Since the *video i.f. amplifiers* pass a wide band of frequencies and are critical, peaked tuning is not necessary.

Mount the rewound coil and trimmer on the assembly bracket. The 1000 ohm filter resistor and the .006 bypass condenser (associated with each *video i.f. amplifier* stage) are also mounted on the assembly bracket inside the shield can, to conserve wiring space underneath the chassis.

Attach proper leads and then place each video i.f. coil assembly can close to its respective stage, as indicated in Fig. 4.

To prevent sound signals from interfering with the video signals, a wave trap—or "sound" trap—is used between the first detector i.f. coil and the grid of the first video i.f. amplifier tube. The "sound" trap consists of a coil L_4 and condenser C_9 in parallel, and tuned to 8.6 megacycles (the sound i.f. signal). Construct the coil of No. 28 wire wound on a ¾ inch form. It is tuned to reject the 8.6 mc. frequency by means of a small trimmer condenser. Connect directly in series with grid of 1st i.f. tube.

All wiring of the first detector and i.f. amplifier stages is now to be completed. But to minimize any tendencies toward oscillation, *make all leads as short as possible.*

The *Contrast* control—associated with the second *i.f. amplifier* stage—is mounted on a bracket below the chassis, and an insulated extension shaft protrudes through a mounting hole in the steel front plate of the receiver (Fig. 3).

After suitable amplification, the video i.f. signal is applied to a *second detector and clipper* stage using a type 6H6 double diode. Output of this stage is *R-C* coupled to the final stage: a *video amplifier* using a type 6V6 beam power tube.

Connect the *second detector and clipper* stage and the *video stage* according to the circuit diagram, but do not complete wiring of the plate circuit of the final, output stage.

Peaking coils L_8 and L_9 may be used, as indicated in the diagram, to bring up the higher frequencies for better picture definition. They are simply 2 watt, 500,000 ohm resistors, R_{72} and R_{73}, with 50 turns of No. 32 wire wound on them.

The video circuit of the television receiver is now ready to be aligned and tested.

Video Alignment

Using a signal generator with an output meter or loudspeaker, the *video i.f. amplifiers* are aligned in conventional manner.

The i.f. stages are stagger tuned, that is, the first coil is tuned to 10.8 mc. for maximum output, the second coil is tuned to 11.5 mc., the third coil is tuned to 12.0 mc., and the fourth i.f. coil is tuned to 12.6 mc.

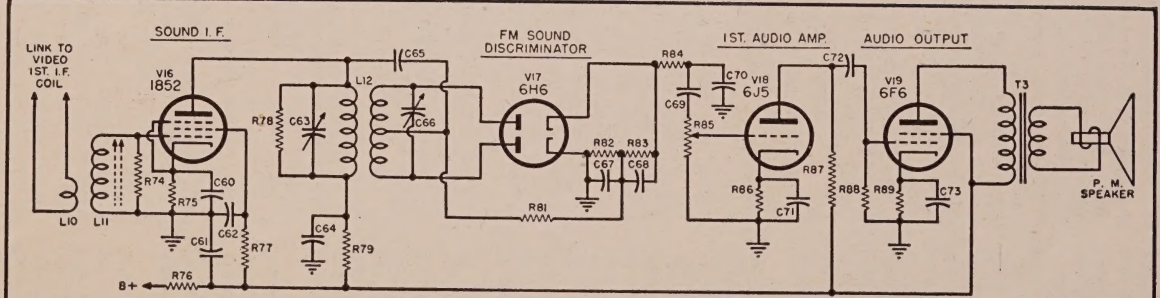
Connect the output or loudspeaker across the output of the final *video amplifier.* Short out the tuning condenser of the *local oscillator,* and turn the *Contrast* control up (clockwise).

Then attach the leads from the signal generator between the grid of the *first detector* and ground, and adjust the signal generator for maximum output.

Tune each i.f. coil assembly for maximum output from each stage. Changes in some or all of the i.f. coil windings may be found necessary. Alignment procedure should be repeated several times.

If no signal is indicated in the output of the video circuit, turn off the set and carefully recheck the wiring and construction of all video stages. Start with the final amplifier and work back step-by-step, to the first detector—until the trouble is found.

After the i.f. coil assemblies of the video circuit have been properly aligned, disconnect the signal generator and output indicator and remove the short across the oscillator tuning condenser. Then connect the output of the *video amplifier* to the grid of the



R_{74}, R_{75}—200,000 ohm, ½ w. res.
R_{75}—200 ohm, ½ w. res.
R_{76}—100 ohm, 10 w. res.
R_{77}, R_{82}, R_{83}, R_{87}—100,000 ohm, ½ w. res.
R_{79}—1000 ohm, ½ w. res.
R_{81}, R_{84}—75,000 ohm, ½ w. res.
R_{85}—500,000 ohm pot.

R_{80}—2500 ohm, ½ w. res.
R_{88}—250,000 ohm, ½ w. res.
R_{89}—500 ohm, 5 w. res.
C_{60}, C_{62}, C_{64}, C_{66}, C_{72}—.01 μfd., 600 v. cond.
C_{61}—8 μfd., 450 v. elec. cond.
C_{63}, C_{66}—*See text*

C_{65}, C_{67}, C_{68}—100 μμfd. mica cond.
C_{70}—.001 μfd., 600 v. cond.
C_{71}, C_{73}—5 μfd., 50 v. elec. cond.
Speaker—5" PM speaker
T_3—Output trans. 6F6-to-voice coil
L_{10}, L_{11}, L_{12}—*See coil table*

Fig. 5. Schematic diagram of the audio section of the television receiver. This channel is link-coupled to the video section.

cathode-ray tube, according to the circuit diagram.

The video circuit is now ready to receive a television picture.

First, make certain that a local television transmitter is on the air, preferably a station operating on one of the higher frequency channels. Then tune the receiver to the station. Adjust the trimmer across the tuning condenser of the *first detector* for maximum picture brilliance. Controls on the front panel are used to bring the picture into sharp focus and desired intensity.

If no picture is visible on the cathode-ray tube, insert a pair of phones and a small condenser in series across the output of the *video amplifier*. If a signal is audible, the r.f. coil of the *local oscillator* may have to be pared to bring the receiver into the television band. Absence of any signal indicates either (1) the transmitting station is off the air, or (2) there are undiscovered defects in the wiring, adjustment, or alignment of the video circuit.

Sound Stages

The four-tube sound circuit consists of a *sound i.f. amplifier* stage using a type 1852 tube, followed by an *FM discriminator* stage using a type 6H6 double diode. Audio signals from the *discriminator* pass through a 6J5 *voltage amplifier* and are then applied to an *output amplifier* stage using a type 6F6 tube to feed a 5-inch PM speaker.

The complete sound circuit is constructed on a small, separate chassis (Figs. 1 and 5), which is supplied by the builder. Dimensions are not critical, but the chassis must be small enough to fit snugly in place on top of the main chassis and yet be large enough to accommodate the four sound tubes, two i.f. coil assemblies, and other parts.

As previously mentioned in the discussion of the video stages, the i.f. coil, coil, L_{10} L_{11}, and the discriminator coil, L_{12}, assemblies can be easily constructed from old or defective 465 kc. i.f. transformers used in broadcast receivers. Note that the top view photograph shows L_{10}, L_{11} as an iron core slug assembly. Should a coil of this type be easily obtainable, it may be used

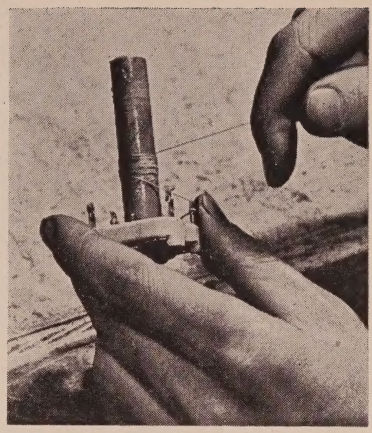


Fig. 6. Photograph shows method of winding i.f.'s on old coil forms. For complete coil specifications see Table 1.

in lieu of a home-constructed coil. It is possible, however, to build your own shielded i.f. coil and use it in place of the iron slug type unit. In doing so, strip all wiring and unwind the old coil. Keep the coil forms, assembly bracket, bolts and shield cans.

The intermediate frequency of the sound signal is 8.6 megacycles.

To construct a coil for this frequency, wind about 25 turns of No. 28 wire on a ¾ inch coil form (Fig. 6).

The *first* i.f. coil assemblyy also has a 2-turn loop primary winding. This winding is link coupled—via two well insulated leads—to the first i.f. coil of the *video* circuit, and thus supplies an input signal for the sound circuit.

Make a 2-turn loop on the coil form of the first *video* i.f. coil, bring the two leads to the sound chassis, and then connect them to the 2-turn loop on the coil form of the first *sound* i.f. coil assembly. Each 2-turn loop should be in close proximity to the main coil winding, but the degree of coupling is not critical. However, all windings on any single coil form must be in the same direction. Mount coil assembly directly on chassis.

The *second* i.f. coil assembly of the sound circuit (used with the *discriminator* stage) has both a primary winding and a separate secondary winding. The secondary winding is center-tapped as shown in the circuit diagram. Again, both windings must be in the same direction.

The trimmer condensers retrieved from the old broadcast band i.f. transformers can also be used across the newly wound sound i.f. and discriminator coils, since critical peaking is not necessary. Further, both sound coils are deliberately broadened by placing 200,000 ohm resistors across the windings.

Mount discriminator coil with trimmer and resistor on its assembly bracket, attach leads, and cover the coil assembly with a shield can. Then place coil assembly close to its respective stage (Fig. 1).

Install the 5 inch PM speaker behind the lower opening in the steel front panel.

Mount tube sockets and tubes, and complete all wiring of the four stages of the sound circuit, according to the circuit diagram. Leads associated with the *sound i.f. amplifier* and the *discriminator* stages should be as short and direct as possible.

Power for the sound circuit is obtained from the video power supply.

After assembly. the sound chassis is attached to the main receiver chassis, and the sound circuit is aligned in the conventional manner.

Operation may often be improved, however, by further *realigning* of the sound circuit when the television receiver is actualy tuned to a transmitting station.

Sight and sound must be synchronized. When they are not, it's a good indication that the video or sound i.f. amplifier stages are improperly aligned.

When the television receiver is functioning normally, the set is ready for installation and connection to an antenna.

Installation

Twin-parallel 300-ohm feeder line is used to connect the receiver to its antenna, and this transmission line may be of any reasonable length. At the receiver, this line terminates in a 2-turn loop inductively coupled to the *first detector* r.f. coil assembly. The 2-turn loop must be center-tapped to ground, and must be wound in the same direction as the r.f. coil. The two windings may be loosely coupled.

It's important that the antenna of any television set be given considerable consideration with regard to type of design, construction, and installation, because the effectiveness of the antenna greatly influences the operation of the receiver.

The designer of this set, Leon S. Wecker, recommends use of a folded dipole, constructed from a section of 300-ohm twin-parallel feeder line.

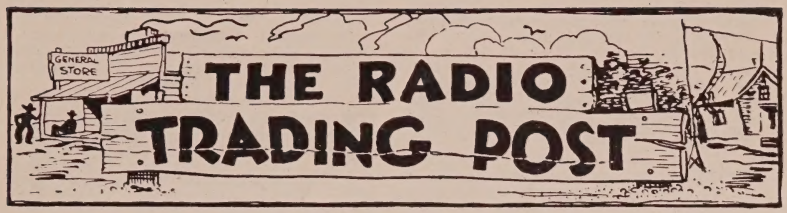
Cut off a 7-foot section of the transmission line. Close and solder the pair of wires at each end. At the exact center of the 7-foot section, nip one of the pair of wires and pull out the ends from the plastic dielectric. At this point connect the feeder line (which leads to the input of the receiver). Since the plastic shield material melts easily when heated, use a red-hot nail or piece of metal to join the two pieces of plastic in a strong physical bond.

L_1—*Pri. 2 t. #28 wire c.t. Sec. 3 to 4 t. #14 wire, ¾" diam. (See text)*
L_2—*Osc. coil 3 to 4 t. #14 wire, ¾" diam. (See text)*
L_3—*I.f. trans. Pri. 17 t. #28 wire on ¾" diam. form. Sec. 2 t. #28 wire link*
L_4—*Sound trap 25 t. #28 wire on ¾" diam. form*
L_5, L_6, L_7—*I.f. trans. 17 t. #28 wire on ¾" diam. form*
L_8, L_9—*Peaking coils 50 t. #32 wire wound on 2 w., 500,000 ohm resistor*
L_{10}, L_{11}—*Sound i.f. Pri. 2 t. #28 wire link Sec. 25 t. #28 wire on ¾" diam. form*
L_{12}—*Discriminator trans. Pri. 25 t. #28 wire on ¾" diam. form; Sec. 25 t. #28 wire c.t.*

Table 1. Coil specifications.

With the wires extended taut and supported by insulators or other *non*-metallic means, mount the folded-dipole antenna in a horizontal position and as high as possible. Position of the antenna *in azimuth* is adjusted for reception of the clearest and brightest picture images from a desired television transmitter, indicating maximum signal

(Continued on page 15)



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NEED—1 Thordarson cht. input transformer No. 15A74. Can be used, but must be in A1 condition. State price and condition. All replies answered. Stanley J. Lucas, Box 458A, Morris Plains, N. J.

FOR SALE—Superior CA-10 signal tracer, A1 condition. First $10 money order gets it. Williamson Radio Service, Cooper, Texas.

FOR SALE OR TRADE—35-watt Rauland amplifier; wire recorder; Meissner-made f.m. tuner; 12" Rek-O-Kut recording assembly; dual-speed motor;. Want: test equipment, photographic equipment. Stanley Roszewski, Ellington Ave., Rockville, Conn.

FOR SALE—Webber test bench consisting of tube tester to 117 volt tubes, volt-ohm milliammeter, vibrator tester, RF signal generator, test speaker, multi-range antenna. All mounted on movable bench with drawer. Original price, $445. In good condition—make me an offer. John Porter, 848 West Delavan, Buffalo 9, N. Y.

FOR SALE—R.C.P. signal generator, model 702, in perfect operating condition, with operating instructions. Price $40.00. W. R. O'Neal, 246 Wine St., Mullins, S. C.

FOR SALE OR TRADE—Model CA-11 signal tracer, complete with instructions, $18.75, or will trade for 1-3 hp. electrical motor, 110 V. AC, about 1800 RPM. Marvin Weber, 3419 Butler, Fresno, Calif.

FOR SALE—Complete stock of radio parts. Send for list. Electronic record player, $25.00. Over 300 pictures taken in India and China, $12.50. Hand-made Archers linen bow strings, $1.00 each. Special discount in quantities. Jack Miller, 1017 Cedar, South Bend, Ind.

FOR SALE—Superior CA-11 signal tracer, used, but in good condition, $12. Frank D. Hill, 316 No. Weston St., Rensselaer, Ind.

WANTED—Used car radios, any condition. Describe and state price. The Simplex Shop, Salina, Kansas.

WANTED—Used television set. State make, model, condition and price. Charles Sovatsky, 443 De Kalb Ave., Brooklyn 5, N. Y.

FOR SALE—Two Army parachutes, aircraft flight instruments, flying clothing, navigation equipment, drafting machine, 35mm slide projector, photo equipment. Want: Rider's manuals, radio test equipment, band saw, box brake, squaring shears. All inquiries answered. C F. Allen, 616 Chenango St., Binghamton, N. Y.

FOR SALE—Hallicrafters, model S-40 communications receiver with S-meter, in new condition. Albert Penney, 378 Oaklawn Avenue, Stamford, Conn.

FOR SALE OR TRADE—Five 1 MFD 10,000 volts DC WKG Inerteen condensers. Three 1 MFD 6,000 volts DC WKG Pyranol condensers. One 5,000 volt, CT, one KVA. 110 volt primary transformer. W1IJL, 594 Springfield St., Chicopee, Mass.

FOR SALE—Model 802, tube tester and set, in good condition, over-hauled at factory. First $30 takes it. Bert Buckner 280 W. Central, St. Paul, Minn.

FOR SALE—Two 15" Jenson auditorium E. D. speakers, model B15 x B5060. $60.00 for both. $35.00 each. The King's Pictures, 119 Eighth Ave., Haddon Heights, N. J.

WANTED—Riders manuals, volumes 8, 9, 10, 11 and 12. Kindly state price and condition. John Deavereaux, 940 Everett St., El Cerrito, California.

WANTED—Hickok RFO-4 or PFO-5 Oscilloscope. Roy M. Beyer, 1927 No. Madison St., Saginaw, Mich.

FOR SALE OR TRADE—LM frequency meter, low voltage Selsyns, instructograph, precision 914 tube tester, 12 sets Sams photofacts, IRC volume control kit, ham-built signal tracer, 5" scope tube. Want SCR 522, BC 645 Hosea Decker, 44 Campbell St., Delaware, Ohio.

FOR SALE—Supreme Publications most used diagrams of 1939, 1940, 1941,1942. All four $4.25 postpaid in U.S.A. Like new. Otto M. Johnson, 5765 Gratiot Rd., R. 6, Saginaw, Mich.

FOR SALE—Used tubes. One dollar each postpaid. All tested, boxed and guaranteed. Limited quantity on hand. Graham Polonsky, 2100 Massachusetts Ave., Cambridge, Mass.

WANTED—Books and courses in electrical, radio and television engineering. Please write, stating facts and price. Stanley T. Galaski, 223 54th St., Brooklyn 20, New York.

FOR SALE—50c each or 3 for $1.25, postpaid in the U. S., per double unit. 1 R.C. type "WW4" precision wire-wound multipliers and shunts, all units are double. R. J. Fogg, 1125 Lafayette, S. E., Grand Rapids 7, Mich.

FOR SALE—One each Mallory No. 222 and 245, Radiart No. 3315 and 5400. Prepaid by mail for only $14.60. Check or money order. Johnson Radio, 302 Oakwood St., Austin, Minn.

WANTED — BC-624 Receiver converted for 144MC. band, or unconverted in new condition. Have BC-625 Xmitter, SCR-274N, 6-9MC. Receiver. Want 190-550KC. Receiver also. Paul West, Box 722, Martinsburg, W. Va.

FOR SALE—Meissner, AC-DC battery 6 tube Portable Super Heterodyne Receiver, No. 10-1190, complete with tubes and batteries, equipped with pilot light and switch with outlet for phone or speaker reception. Perfect condition. J. Lipiner, 1032 Rutland Road, Brooklyn 12, New York.

TRADE — Rider Manual, Vol. 1. Prepared exclusively for N.R.I. Value $14.50. 1598 pages. Includes aligning procedures. Want used tube tester in good condition. Ben Marconi, 120 Gatling Pl. Brooklyn 9, New York.

FOR SALE—One RCP Model 802N Combination tube-set Tester and one A200 Signal Generator Freq. Range 100 KC.-75MC. $99.00 for both. L. Frohlinger, 76 First Avenue, New York 3, New York.

SELL OR TRADE—Oscilloscope, Fascmile printer and all kinds of radio equipment and books. My list for yours. Paul Brassard, Box 353, Brunswick, Maine.

FOR SALE—Hallicrafters SX11 Communications Receiver, 550 KC to 33 MC. One RF, two I.F. stages, P.P. 6L6's output. Includes speaker and Xtal filter. Ready to go, $45.00. W2KAK, 49 Underwood St., Newark, New Jersey.

FOR SALE—Weston test set, Graflex camera, radios, parts for transmitters, Meissner Signal Shifter and others. W2BUU decreasing his excess parts. Joseph B. Forman, 180 Montague St., Brooklyn 2, New York.

FOR SALE OR TRADE — Readrite Model 710 Analyzer in good condition. Want small 2 or 3-tube Short Wave Set. All letters answered. Bernard Krinsky, 2840 West 24th Street, Brooklyn 24, N. Y.

FOR SALE—One Jackson V.O.M. model no. 645. In original carton. Xavier Curio, 4430 De Reimer Ave., Bronx 66, New York.

FOR SALE—Mobile or Fixed TR-4 Transceiver with removable J antenna for car or home use. Complete with tubes, power supply for 110 or 6 volts. Range 130 to 170 megacycles. A1 condition. Make offer. Walter Ninneman, c-o WLBL Transmitter, Auburndale, Wisconsin.

FOR SALE—35mm. German Beirette camera. Deckel-Munchen Compur-rapid 1-500th shutter, Schneider-Kreuznach f.2.9 50mm. lens. Uses American 35mm. film. Automatic film counter & double exposure prevention. Like new. Complete with case. Price $50. David L. Bichler, 2876 Jerome Ave., New York 58, N. Y.

FOR SALE—National SW-3 Receiver A.C. Model. Coils for 80, 40, 20, 10 meters. Good condition. $25. W4JYX, H. K. Weber, 2334 Date, Louisville 10, Ky.

FOR SALE — Weston Meter Rectifiers. 4 MA. MAX $1.50. Sensitive DC relays, coil 800 OHMS, contacts S.P.S.T. silver rated 1 amp. Will operate on 1.100 of a watt. $1.25 ea. Mack, Box 123, New Hyde Park, New York.

FOR SALE—Large list of radio and non-radio items, including tubes, cabinets, gift items, electrical and lamp material. G. Lankofsky, 527 Bedford Ave., Brooklyn 11, New York.

FOR SALE—1 Sylvania tube tester; 1 Vomax VTVM almost new, large stock tubes, parts, service manuals at big discounts. Robert Fellows, Caledonia, New York.

FOR SALE — Model E200 Precision Signal Generator, instruction book on signal substitution. Price $50. Max M. Finkelstein, 1711 Ocean Parkway, Brooklyn 23, New York.

WANTED — N.R.I. or other good radio course. State price and description. If you wish trade, state offer. Joseph M. Segel, 5214 Spruce St., Philadelphia 39, Pa.

FOR SALE — Hickok 203, $75. Silver 904, $44.50. Precision 920, $65. Sporna Radio Service, Escatawpa, Ala.

WANTED — Complete set Rider's Manuals. Must be in good condition and reasonable. J. W. Pasternak, 12 Walnut St., Lawrence, Mass.

WANTED — Transmitter. Good factory made. Hallicrafters, Temco, Supreme, Collins, Meck, etc. Harvey Cunningham, W5CU, Box 55, Zapata, Texas.

FOR SALE — Spaghetti tubing. Fiberglas, varnished, extruded plastic. Various sizes and colors. 35,000 feet. 1000 feet for $4, or trade for what have you. Sylmian Industries, 4800 N. Lawndale Ave., Chicago 25, Ill.

WANTED — Experienced Radio Service Men. Growing business. Good pay. Write full particulars to Mendel's Radio Laboratory, 71 South Main St., Barre, Vermont.

FOR SALE — Radio tubes in cartons. Hard to get numbers. 40% off list. Have no list. Just send order. State other needs also. Radios and parts available. Academy Radio, 1901 Mott Ave.,Far Rockaway, New York.

FOR SALE OR TRADE — U.S. Army Surplus in original boxes, 1T4 Radio Tubes. Desire camera or price offered. All letters answered. Seligman Radio, 346 Lewis Ave., Brooklyn 33, New York.

FOR SALE — Westinghouse Volt-Amp. meter; Ohmite resistors .5 meg.; tubes; various meters used but in excellent condition; radio parts, guaranteed, 60% off; Singer sewing machine; household refrigerator compressor with or without 1/4HP motor. R. Mannings, 1-74th St., Brooklyn 9, New York.

WANTED — 3A8 Radio Tubes in good condition. State price. V. J. Balcar, 3805 Alice Ave., Austin, Texas.

WANTED — Hallicrafter S-20R Sky Champ or SX-25 Super Defiant. Have Sky Buddy S-19R in perfect condition for sale. All letters answered. Martin A. Weiner, 985 Adee Ave., Bronx 67, New York.

WANTED — Rider's Manuals through set XIV. State price and condition. Also "A" eliminator at 6V.-10Amp. 110 AC input. Casanova Radio Service, 84 Central Ave., Hamden, Conn. Ph. 2-2911.

TRADE — Have BC-312, with 110 V. AC power supply. Disassembled ARC-1 Record Changer; Signal Gen BC-6S4-A complete. Will trade for up to date Comm. Revr. Freight charges Collect. W2SMV, James Majors, 51 Vine St., Waterbury, Conn.

WANTED — Rider's Manuals 1 to 14, either as a set or individually. Do not want the 1 to 5 abridged edition. All manuals must be complete and in good condition. State price. All letters answered. John W. Findarle, Rt. 1, Box 1061-G, Modesto, California.

SELL OR TRADE — National "FBX" short wave receiver with pre-selector, crystal filter, power pack and spare coil forms. Want enlarger. Willard Smith, 50 N. Bedford, Arlington, Virginia.

SELL OR SWAP — QST and Radio back to 1928. Complete list on request. Need Audio equipment, Recording, Sound, etc. A. T. Hennek, 204 Range St., Mankato, Minnesota.

SWAP OR SELL — Lincoln Engineering School Course complete for CC-1-60 Solar Condenser Checker. All letters Answered. Cloyd's Radio Shop, 454 So. 3rd St., Hamilton, Ohio.

FOR SALE — 16mm DeForest Projector, hand driven. Make a reasonable offer. Also 8mm Univex camera in good condition with carrying case. C. Stuart, 1908 Dunham, Toledo 9, Ohio.

SELL OR TRADE — Superior Tube Tester and Analyzer, $20. "Masco" Portable Phonograph with built-in amplifier and speaker, $22.50; Record Changer, $12.50; Maytag engine, $20; Auto Radio, $12.50. E. G. Bartlett, Atlanta, Missouri.

FOR SALE — Completed Transvision Television Kit receiver, in working order. Neat, careful workmanship. $195 cash F.O.B. J. W. Massecar, 2737 Broadway, Huntington Park, California.

FOR SALE OR TRADE — N.R.I. Radio Repair Correspondence Course. Would like a Television kit or set. Charles A. Kuhns, 3132 Broadway, San Diego, California.

SELL OR SWAP — Astatic Model Mike WR-40, dual diaphram, multi-unit Xtal. Can be used with up to 200 feet of cable. Like new. Would like 22 Repeating Rifle or make offer. All inquiries answered. Bill Hagara, Slickville, Pa.

FOR SALE — Superior Signal Tracer. In A1 condition. Price $15. Also Rider's Practical Radio Repairing Hints, $2. Radio Construction and Repairing, $1.50, Also several other books and manuals on radio and electrical service. Better Radio Service, 1601 Williams St., McKeesport, Pa.

FOR SALE — Supreme Analyzer and Tester, Model 339; Perfect working condition. Clough Brengle Oscillator, Model O-C. Frequency true and precise. $10 each. Oneoba's Radio Service, 1938 So. 16th St., Springfield, Illinois.

FOR SALE — Supreme Model 589-A Tube Tester. Hickok Model OS-10 RF and AF stamp collectors, my list of nearly 100 instruments for $70. Earl D. Squier, 503 E. 9th, Escondido, California.

WANTED — 16 inch Radio Broadcast Transcriptions 33 1/3 rpm, must be lateral cut, dance orchestras and 15 minute programs. Inform me what you have. Have G. E. Portable Broadcast and S. W. for sale, $12. John J. Farkas, 3508 Main St., East Chicago, Indiana.

FOR SALE — Portable Record Changer with amplifier, $37.50. Precision V.O. M. 844P $30. 5 tube A.C. Radio, no dial or cabinet, $50. Box of radio parts, $5. William Thowe, 1002 Victoria St., San Antonio, Texas.

FOR SALE — 1D8, 1F6, 1F7, 1G5, 1H6, 1J6, 1LE3, 1LC6, 1LN5, 1SA6, 1A3, 1U4, 3A8, 3Q4, 3S4, 2A3, 2A4, 2A5, 2A7, 6AF7, 6AF6, 6AK5, 6F5, 6K5, 6I5, 6B5, 6N6, 6E7, 6J8, 6SF7, 6Y5, 6Z5, 7G7, 7H7, 7B8, 12A7, 12B7, 12C8, 12K7, 12K8, 12Q7, 15, 25A7, 25A6, 25I6, 25Y5, 25Z5, 25Z6, 32L7, 43, 47, 70L7, 75, all guaranteed. Goodwin Radio Shop, Rankin, Illinois.

TRADE OR BUY — Want tube tester, signal generator, condenser checker and channel analyzer. Give full description when replying. Will pay cash or trade tubes or meters. Sam Berenblum, Greenwich, Conn.

FOR SALE — Model T53 Serial No. 530575 Hickok Tube Checker in first class condition, adapters for all tubes. No reasonable offer refused. A. J. Orth, Callicoon, N. Y.

WANTED — Perfect Silver 90KC-210MC generator. Have Simpson Model 315 generator in special exchange. Phone or write. Harry's Electronic & Servicing Co., 2053-3rd Ave., New York, N. Y. SA 2-7362.

SWAP AND WANTED — Synchroscope, 3 inch model T.S.-64/M.P.N.-1. Scope is calibrated in sweep speed. Want to trade for good 5 inch standard scope. Want defective or damaged 5 in. Dumont Oscilloscope, No. 208B. H. Bree, 82 Wharton St., Newark 5, N. J.

FOR SALE — Ghirardi's Radio Physics, $3. Questions and Answers—Nilson & Hornung, $1.50 (1940 ed.). Also for stamp collectors, my list of nearly 100 World Philatelic Agency addresses is available for only 25 cents. H. Brody, 355 Stockton St., Brooklyn 6, N. Y.

WANTED — 1890 Winchester 22 L. R. repeater in good condition; also 22 target revolver or automatic. Interested also in watches, kodaks and musical instruments. A. E. Levriett, Box 3542 Sta. F, Jacksonville, Florida.

WANTED — 2 new or used 12B8 G.T. tubes. Russell Radio Service, 4257 West Ashland St., St. Louis 15, Mo.

FOR SALE — Two tube T.R.F. kit. Has 4" speaker, tubes are 6SL7 and 12SN7-AC. All parts are furnished. Diagrams and instructions also included. Price, $6.50. Dan & Ted's Radio Shop, 4355 So. Honore, Chicago 9, Illinois.

WANTED — 1936 Oldsmobile custom-matched dash plate and drive with 8 to 1 ratio, with off and on switch, variable tone control and pilot light. State condition and price. Warren Wood, 357 Wilson Road, Fall River, Mass.

SELL OR TRADE — German camera in excellent condition, for Philco 088 signal generator or Triplett 1185 tube tester. Braun's Radio Service, 202 Howard Street, Bellevue, Ohio.

TRADE — Copyright to a printed item excellent for mail-order exploitation at $1 to $2 per sheet, for complete set of radio test equipment capable of doing all modern work, or cash. Give detailed information. Stanley Aufinger, 1234 Maple St., Braddock, Pa.

WANTED — Radio Instructors by old established radio school. Permanent employment, good pay and working conditions. Must have first phone license and at least 3 years practical experience. Electronic Radio Television Institute, 915, Douglas St., Omaha, Nebr.

WANTED — German War Radio with tubes and power supply. Frequency 50Mc. and up. Give all specifications. All letters answered. I have a Fada Portable Radio in fair condition, Model C33. Less tubes and batteries, with diagram, $10 or best offer. Needs tinkering with. Stathis Linardos, 190 Wadsworth Ave., New York 33, N. Y.

FOR SALE — Variety of radio tubes. Many 1, 1½, 2, 6, Volt and others at 50% off. Also Superior 650 Signal Generator at $40, and Solar CB-1-60 Condenser Checker at $20. C. A. Winans, Morris, Illinois.

FOR SALE — Meisnner Analyst, very little used. Complete with instruction book, $75. Also about 100 tubes, assorted lot, 60% of list price. Harry Hollander, 2136 77th St., Jackson Heights, New York.

FOR SALE — BC 348-Q converted for AC with 1st RF operating as pentode and stand-by switch. Excellent condition. $50. You pay shipping. J. Sciscento, 229 NW 30 St., Miami 37, Florida.

FOR SALE — Sprayberry Radio Course. Professional type Record Player with G.I. Green Flyer two speed motor and Astatic Type B-11 arm, volume control, tone control, scratch filter. Also have most all types of radio tubes at 40% discount. Burt's Radio, Box 308, Elyria, Ohio.

SELL OR TRADE — Model 2413 Triplett Tube Tester and Model A-200 Approved Signal Generator. Would like cash, typewriter, automatic player, etc. No reasonable offer refused. Thomas F. LaPenna, 439 College St., Burlington, Vt.

FOR SALE — N.R.I. Vacuum-Tube Volt-OHM Meter. Services AC up to 550 V. in 4 ranges, DC up to 450 V. in 4 ranges, current in 2 ranges up to 45 Millamps. Resistance up to 100 Megs. Complete with batteries, $10. Ben Marconi, 120 Gatling Pl., Brooklyn, N. Y.

SWAP OR SELL — Guitar Amplifier, complete 40 meter transmitter, wire phono player, tungar battery charger, 6 volt vibrapack, 10 meter CW transmitter, portable radio. Need enlarger, camera, projector, testing equipment. Stanley, 2748 Meade St., Detroit 12, Mich.

FOR SALE — Champion Outboard Motors. Deluxe Single, 4.2H.P. $118.50. Send check for full amount or $25 and balance C.O.D.. Dustin Radio Service, 843 Deep Point, Long Lake, R.R. 5, Kalamazoo, Michigan.

FOR SALE — Amateur Station Complete. Hammarlund HQ129X receiver, Stancor P69 transmitter, 60 watts phone-CW, mike, key, antenna, crystals and coils all bands. Excellent operating condition. $250. W2RVD, 15 Tuxedo Ave., New Hyde Park, New York.

FOR SALE — Chemical glassware, equipment, college chemical kits worth $50. $15 takes all. Also have German Mauser rifle with ammunition. Will sell for first reasonable offer. Rifle in perfect condition. Leonard Freud, 912 Boynton Ave., Bronx 59, New York.

FOR SALE — 599 Supreme Tube & Set Tester, $45. 324 Triumph Pocket Tester, $10. 666H Triplett Pocket Tester, $10. 543S Supreme Pocket Tester, $10. NRI Course, including 6 kits complete, $50. Perfect condition. H. S. Merchant, 712 Main St., Pelly Texas.

FOR SALE — Solar CE-1-60 Capacitor Exameter. In original carton with instruction book, test leads and tubes. Shipped by prepaid express for $45. C. W. King, Box 182, Crisfield, Md.

SELL OR SWAP — Two Edison cylinder phonographs, one with horn, cylinders for same. Also old Edison disc phonographs with records. Old issue of radio magazines 1924, up.. W2FW, Jake Nelson, 75 Minaville St., Amsterdam, N. Y.

FOR SALE — Rolliflex-F.4.5 Tessar Compur from 1 Sec. to 1/300 Sec. 12 exposures, 2¼ X 2¼ on 620 film. Complete with case, $75. Guaranteed. S. Brown, 1201 Ogden Ave., New York 52, N. Y.

Build Your Own TELEVISION RECEIVER

(Continued from page 10)

reception. Usually this position will be broadside to the transmitter. But in cities and towns, signals *reflected* by tall buildings may be used to better advantage.

However, if multiple images appear on the picture tube, they may be due to either poor antenna design, poor antenna location, or both.

At times better reception is possible when using a directional antenna. The folded dipole may be converted into a directional antenna simply by placing an 8-foot length of taut, heavy wire 3½ feet behind and parallel to the folded dipole. Both antenna and reflector can be mounted on a wooden framework so they can be rotated together until the point of best and clearest reception is reached.

Further improvements in the physical appearance of the completed television receiver may be made. At a nominal cost, the set can be enclosed in a plywood cabinet or other covering. Such finishing touches can be accomplished at the convenience of the builder.

END

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